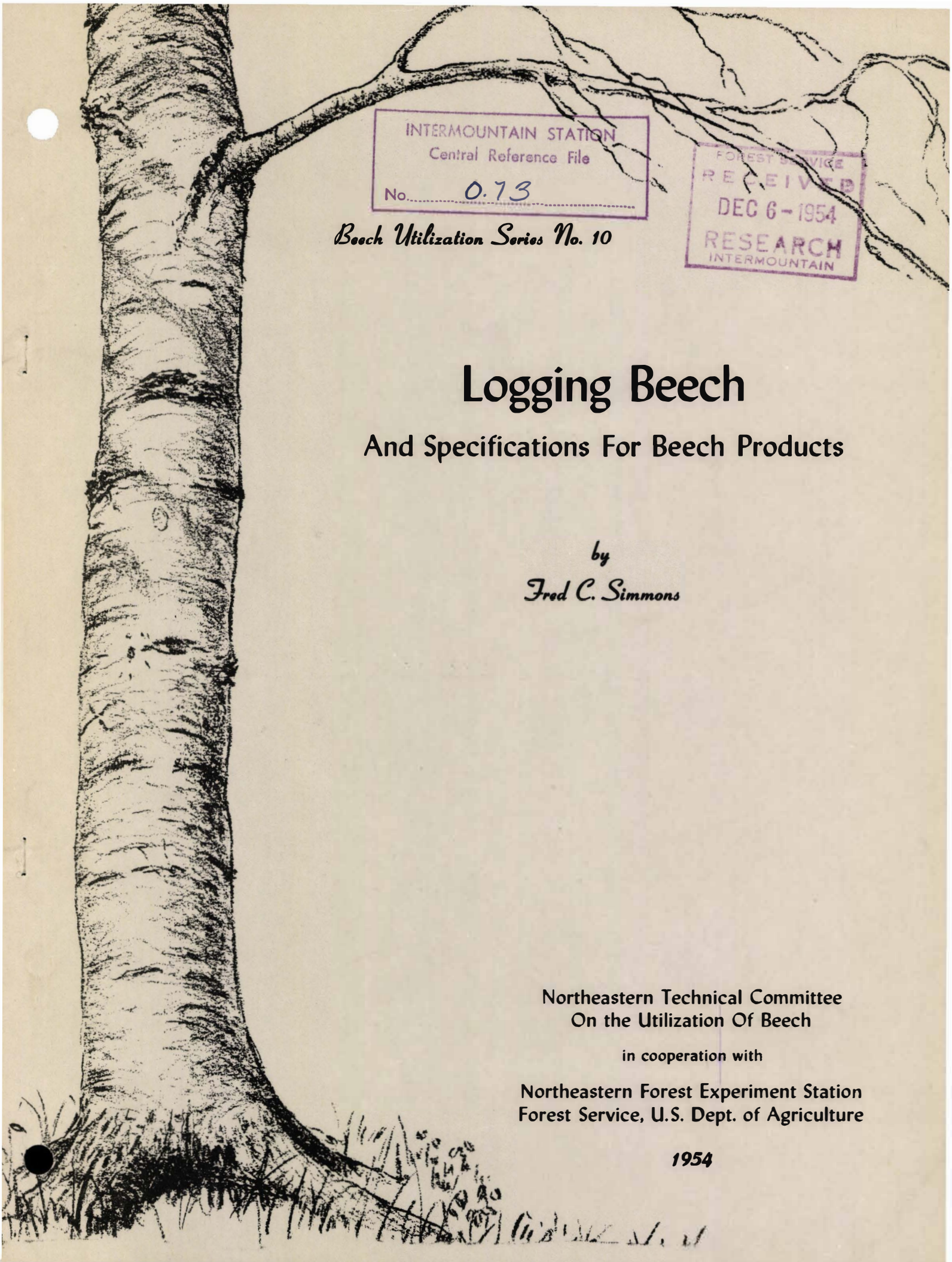

Beech Utilization Series No. 10

Logging Beech

And Specifications For Beech Products

by

Fred C. Simmons

Northeastern Technical Committee
On the Utilization Of Beech

in cooperation with

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. of Agriculture

1954

FOREWORD

The wood of the American beech tree (Fagus grandifolia Ehrh.) is well suited for a large number of uses, and it is rather widely used by manufacturers. Yet the amount used is not in proportion to the amount that grows in our northeastern forests. The utilization of beech--both in the woods and in the factory--has been recognized as a problem.

One reason for this is in the nature of the wood: it has a reputation for being difficult to season. Another is that many of the beech trees in our forests are of poor quality. And there are some plain prejudices against beech.

Research is finding ways to utilize beech as efficiently as any of the other comparable hardwoods can be handled. Considerable information about beech has been gathered. Yet most of this information is available only in fragmentary form in scattered technical reports. Some of it has never been published.

To study the problems of putting beech to the uses it deserves, and to promote the better management of the forests in which it grows, a Northeastern Technical Committee on the Utilization of Beech was organized in 1949. This committee, which includes representatives of Federal and State forestry agencies, universities, and state experiment stations, decided to assemble and publish the available information about the utilization of American beech.

As its part of this cooperative project, the Northeastern Forest Experiment Station has undertaken to edit, publish, and distribute the series of reports that will contain this information.

The subjects of these reports will be as follows:

* Physical and mechanical properties of American beech.

(CONTINUED ON INSIDE OF BACK COVER)

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LOGGING OF BEECH

AND

SPECIFICATIONS FOR BEECH PRODUCTS

by

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AMERICAN BEECH IS FOUND intermixed with other species in many of the timber types of the eastern United States. It is seldom the most common tree in the stand, although it may occur in practically pure clumps or stringers on ridges or in rocky places almost anywhere within its range.

Beech has long been a "problem" species to the northeastern timberland manager. It has been difficult to market, mainly because of difficulties in handling and seasoning it at the processing plants. Consequently it has rarely been logged by itself. Logging operators have usually cut only what beech they were forced to in the process of harvesting the more desired species such as maple, birch, oak, or some of the conifers. Commonly the majority of the beech trees have been left uncut.

Therefore, year after year, there is proportionally more beech in the northeastern timber stands, and less of the more desired associated species. Fortunately (as pointed

out in other papers in this series) improved methods of processing, handling, and using beech are being developed; and market outlets for beech are increasing. The logger who is confronted with increasing proportions of beech in the stands he cuts has more opportunities to use or sell it. Because it has been less heavily cut in past operations, the beech now present in many northeastern timber stands is of better quality than some of the other hardwoods.

Logging of beech is no different in most ways from logging other hardwoods. Beech is heavy to handle; so are many of the other hardwoods. Much of our remaining beech is rotten, crooked, and knotty; other hardwoods are apt to be even more so.

In addition there are some special problems in logging beech. It is more difficult to debark by standard methods than most other hardwoods. Beech logs and bolts deteriorate more rapidly than other hardwoods when they are left lying around in the woods or at the landing. And, probably most important of all, beech is highly variable in quality, and many loggers have not learned to tell good beech trees and sections of trees from poor trees and sections of trees.

THE TIMBER

The logger must select the trees to be cut for market, and he must select and cut out the portions of them to be marketed for various products. This process is particularly important in logging beech. Much of the beech present in northeastern timber stands appears to be of poor quality. But much of it is better than it looks on the surface.

Because of its history in the stands, including years of suppression under other trees, recurrent careless logging, and other disturbances that caused injuries, many of our remaining beech trees are crooked, limby, and otherwise defective.

Beech is susceptible to many types of injury. The bark is thin and easily broken. Mechanical injuries to the lower part of the stem open the way to butt rots. Sleet and wind damage in the tops let in top rots. In many locations frost cracks are common in beech.

Experience in logging beech in a locality will usually show that these indicators of cull and defect are not so serious as they look on the surface (fig. 1). Butt rots in beech can usually be cut out just above where they are visible on the surface, leaving sound timber above. Top rots, similarly, usually do not come far down the stem. Straight frost cracks, into which rot has not entered, may reduce the lumber yield of a log little, if any. Even spiral cracks may not be too serious in these days when short lumber and dimension stock are becoming marketable.

Beech bark is such a smooth light gray in color, and the places where there have been old injuries are so black and conspicuous, that it is easy to misjudge the quality of the wood underneath. Probably everyone has heard of the beech tree in Kentucky, on which the inscription "Dan'l Boon cilled a bar hear, 1792" carved with a knife more than 150 years ago, is still visible. Old branch scars and other irregularities in beech bark last equally long, although the injury to the wood underneath in old-growth trees may be buried under many inches of defect-free wood. In second-growth beech these branch scars must be taken more seriously.

Crooks and limbiness are also subject to discount. Present-day power saws, with a rate of cutting two or three times faster than the old-fashioned crosscut, have made it economically possible for a woods crew to cut down poorer trees for the good sections they contain. Two or three cuts can be made in the time formerly required to make one. Some woods crews in northwestern Pennsylvania have become expert at getting good logs and bolts out of beech that is often extremely limby, partially rotten, and as crooked as a dog's hind leg. By making their bucking cuts at the points of greatest crook or sweep, and by discarding sections containing abrupt crook, limbs, and rot, they produce much better decks of logs and wood than most loggers would believe could have been obtained from such trees. Of course this requires a knowledge of markets for the different lengths and qualities to be produced. The more varied the local markets, the greater the utility that can be obtained from such trees.

MARKETS FOR BEECH

Before we can discuss the methods of logging beech we must consider the markets for it. It is important that the logger know before he cuts beech (or any other species)

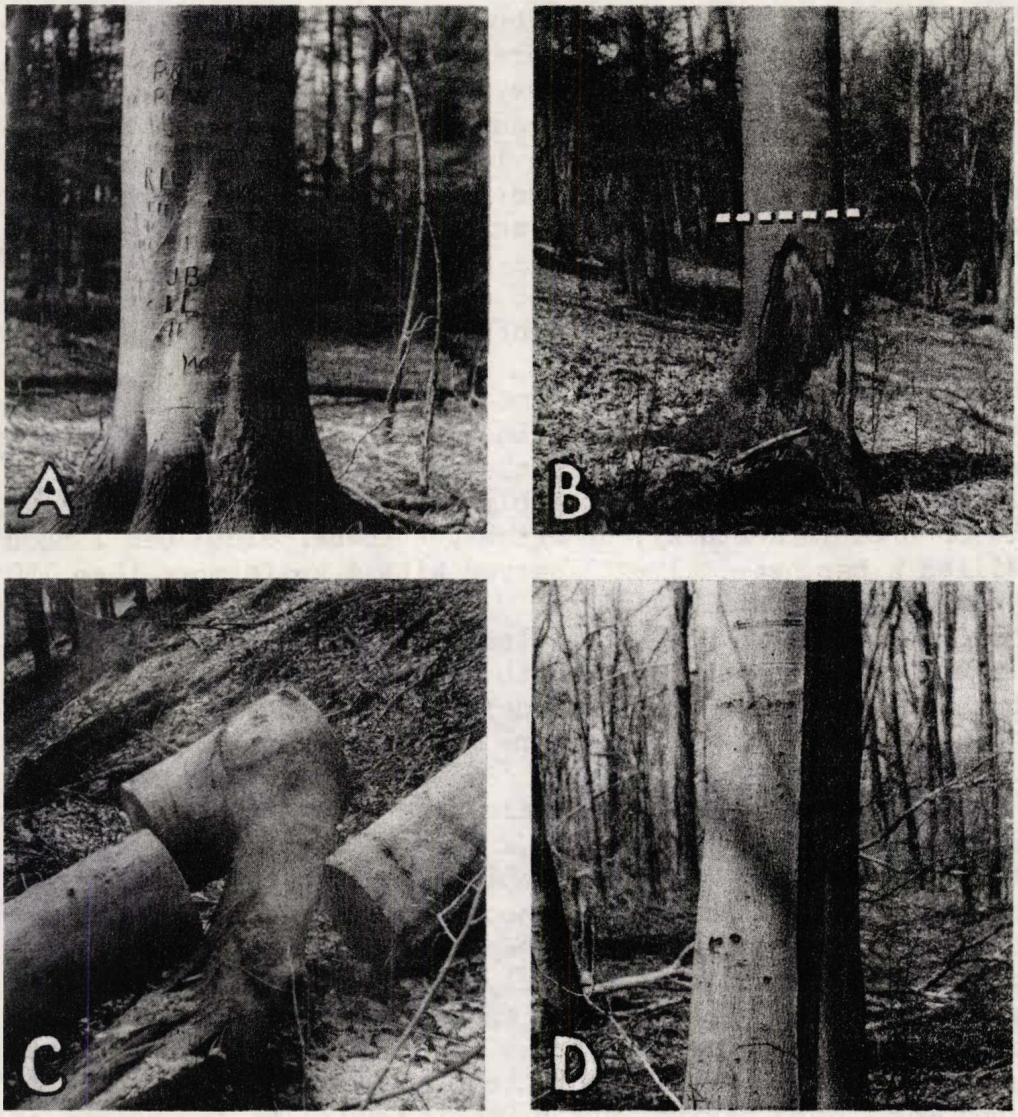

Figure 1.--Beech trees in the Northeast are often better than they look. *A*, even though bark scars persist, the injury may be buried under inches of sound, clear wood. *B*, this tree has a butt wound but the wood above the dotted line is sound.

C, much of the limbiness of beech can be taken care of by intelligent bucking. *D*, straight frost cracks reduce the lumber yield little if at all.

where it is going to be used, and the specifications of the user.

Multi-product logging is usually much more profitable than cutting only those trees and portions of trees that will make one product, such as sawlogs. Even the logger who is cutting for his own mill would be well advised to investigate local markets for other sizes and qualities of wood. Cutting such material for sale, in addition to his own raw material, from the same stands and often from the same trees, may well make the difference between a loss or profit on the logging job. The independent logger, or the farmer cutting his own woodlot, has even stronger reasons for looking up the most profitable and varied outlets for the products of his logging. His local county forester, state forester, or extension forester can usually advise him about what markets are available.

The possible markets and uses for beech logs and bolts are covered in detail in other papers in this series. There are a lot of them. Beech wood has qualities that make it valuable for many different uses.

The major market in most localities is for sawlogs. A number of different types and qualities of logs are recognized, depending on the markets available to or specialized in by the local mills. Some mills specialize in so-called factory lumber, for furniture, interior trim, and novelties; and they demand a relatively high grade of log from which a maximum of high-grade lumber can be cut. Others have markets for structural stock for railroad ties, bridge timbers, and other structural items; and they will take sound logs that are considerably more knotty than those desired for standard lumber. Still other mills have markets for so-called "local-use" stock for such products as field crates and concrete forms; and they will take smaller, more defective, and generally poorer logs. Of course the prices paid for logs reflect the value of the products of the purchasing mill.

There is also the veneer-log market, which usually requires better sections of the stem than the standard sawmill will accept, but is willing to pay two to three times as much for them. Commercial-veneer plants, which require the highest quality logs, are widely scattered throughout northeastern timber-producing areas. Not all of them make veneer from beech all of the time. Container-veneer plants, which more commonly use beech, are concentrated for the most

part in western New York State, in New Jersey, and on the Del-Mar-Va Peninsula.[1] In New York State particularly, these plants provide a good market for beech bolts and logs of a standard sawlog quality, at about the same prices paid by sawmills.

In addition, there are numerous markets that call for less than sawlog-size material. The logger getting out sawlogs or veneer logs can often dispose of his smaller material in these markets.

Of increasing importance in the Northeast is the boltwood market, which demands short lengths to be sawed on short-log sawmills or bolter saws. Such mills have long been established in northern New England, where they formerly used white birch almost exclusively. Many of them are now buying increasing quantities of beech, yellow birch, and hard maple. Bolt mills are also being established in many other sections of the Northeast to make better use of the smaller hardwoods.

Beech bolts are generally bought in 4-foot lengths, but some mills making special products such as shovel or mop handles want 5- and even 6-foot bolts.

Pulpwood probably provides the largest and most rapidly expanding market for beech wood of less than sawlog size and quality. Pulp mills using dense hardwoods are now widely scattered throughout the Northeast; additional mills are continually coming into this market as the more favored pulping species become scarcer and more expensive. Generally, because there is so much pulpwood of this type available, markets are confined to the immediate vicinity of such mills.

Beech is also in demand in certain localities for the manufacture of charcoal. Markets for beech for posts and round mine timbers are available in some places. Beech is one of the better woods for fuel.

Some general specifications for logs and bolts suitable for these various markets are given later in this paper. Not all of these markets are available in every locality,

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[1] COOK, DAVID B. BEECH FOR CONTAINERS. NORTHEAST. FOREST EXPT.STA.. BEECH UTIL. SER. 7. 13 PP.. ILLUS. 1953.

but enough of them are usually active to make it possible to market most of the cubic volume of wood that can be cut from the beech trees on current logging jobs.

It cannot be too strongly stressed that the logger should have an order or contract for the various kinds of material to be cut. Pulp mills are known to stop buying at times when their woodyards are full or when a shutdown becomes necessary, leaving loggers with unsold material stacked in the woods to rot. Markets for sawlogs, veneer logs, and other products can disappear in the same way. And beech logs are peculiarly subject to deterioration during storage.

In summary, know what you can sell, where you can sell it, and what the specifications are, before you begin cutting. Then cut from each portion of each tree the highest value product it is capable of producing.

THE LOGGING JOB

Methods & Equipment

The same methods and equipment will necessarily be used for logging beech as are used for logging its associated species. Choice will be dictated in large part by the size of the operation, the resources of the operator, the terrain on which the timber is growing, and the type of labor available.

The small operator, cutting less than 10 thousand board feet of sawlogs or 25 cords of wood a day, usually cannot afford a big tractor-and-arch combination. A small tractor or team of horses would be more appropriate. A wheeled circular saw cannot be used to advantage in rough and rocky northern woodlands. A sawmill without a log pond or log-washing facilities will want its logs brought in as free of dirt and embedded gravel as possible. This is particularly important in glaciated country. These are examples of the things the logger will have to consider in choosing methods and equipment.[2]

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[2] SIMMONS, FRED C. CHOOSING METHODS AND EQUIPMENT FOR LOGGING. NORTHEAST. FOREST EXPT. STA., STA. PAPER 18. 19 PP., ILLUS. 1948.

Cutting beech by hand involves a lot of hard back-breaking work. When hand-operated crosscut or bow saws are sharpened and set to cut hardwoods with the least effort they do not stay in good condition very long. It is common practice among professional woodsmen cutting northern hardwood sawlogs to take two freshly filed crosscut saws into the woods each day, one for use in the morning and one in the afternoon. With hand tools there is a great temptation to make the cut in the easiest place possible. This too often means cutting in the middle of a clear portion of the tree stem. Making the cut there reduces the value of the logs obtained.

The power chain saw is a good tool for cutting beech--or any other hardwood. Chain saws are fast becoming the standard tool for cutting hardwood stands in the Northeast. Development of the 1-man models has been so rapid, service facilities are becoming so common, and knowledge of the techniques of using and maintaining the 1-man chain saw is becoming so widespread that it is uncommon to find a crew cutting hardwoods with a crosscut saw--or even with a 2-man chain saw.

The 1-man saw is generally used with from a 20- to 30-inch guide bar. The teeth on the chain, particularly the J-shaped router type, are easily resharpened. For cutting hardwoods, teeth of hard steel alloys or chrome-plated steel are recommended.

A 2-man crew is used with the 1-man chain saw, either for felling alone, where skidding is done tree length; or for felling and bucking where logs are being made in the woods. One man runs the saw, and the other does the ax work necessary to keep it running steadily, including swamping, notching, limbing, and measuring. With this type of crew, production is commonly twice that per hour formerly attained in the same type of stands by a 2-man crew working with a crosscut.

Where the 2-man chain saw is used, a 3- or 4-man crew must be used to attain a comparable efficiency. The 2-man saw is recommended only for those rare stands that contain numerous trees more than 30 inches in diameter.

Felling

Felling beech is not particularly difficult. This species is not apt to split; so special care need not gener-

Figure 2.--In logging beech, the feller has a problem in handling rotten-butted trees. A cornering technique is helpful. The rotted butt is cut off, and sound material is usually found a foot or so above it.

ally be taken to prevent this even in bringing down lopsided or leaning trees.

But felling butt-rotted trees is difficult, because they are apt to topple over before you expect them to. Frequently with beech it is possible to make the felling cut above the badly rotted portion by cutting a high stump. In such cases the technique is the same as with sound trees.

When it is necessary to cut through the rotted portion, cut a shallow notch, in sound wood as much as possible (fig. 2). The backcut is then made from the opposite side, frequently using a cornering technique to keep the saw cutting most of the time in sound wood. Three or four inches of sound wood are left on each side, however. Then the final backcut is made straight through parallel to the notch, using all the speed of which the saw is capable. Now the cutter must be alert for the first sign that the tree is

going over; he must be ready to devote the last second or so to cutting a little deeper on one side or the other in case the tree starts to topple away from the intended direction of fall. Then he makes his gateway over a planned route to a safe place while the tree goes down.

When the rotten-butted tree is on the ground, the feller usually has the responsibility for cutting off the badly rotted portion. Here is a good general rule for determining where to cut the rotted butt off: Poke a stick up into the hollow butt as far as you can, then lay the stick on top of the log and mark how far in the stick went; cut about a foot above the mark. For open-faced rots, cut at the top of the open face. Usually you will find there is merchantable material above this point.

An exception to the general rule that beech is not apt to split occurs when there is a deep frost crack on one side or the other of the intended direction of fall. Such cracked trees are apt to split along the crack in felling unless the usual precautions to prevent this are taken. These include an extra-deep notch, cornering, and, in particularly bad cases, cinching a log chain around the bole a couple of feet above the cut.

Bucking

Bucking, as has already been pointed out, is critically important in logging beech. The smart logger is one who knows log qualities. He can increase the value of the material he cuts as much as 50 percent in the bucking operation. Figure 3 shows correct and incorrect methods of bucking in several typical situations.

On the bigger operations, where the necessary equipment for tree-length skidding is available, bucking is usually done best at the landing. There, with the tree length up off the ground on skids, the difficult cuts can be made more easily at the points of greatest crook, or at knotty or rotten places. A bucking crew at the landing is generally more easily supervised by the logging boss. Also, checking and entry of decay and stain into the ends of cut sections are delayed when the bole is kept intact as long as possible.

Minor products, such as charcoal wood and even pulpwood that it would not pay to bring out of the woods separately, can literally be given a "free ride" when they are

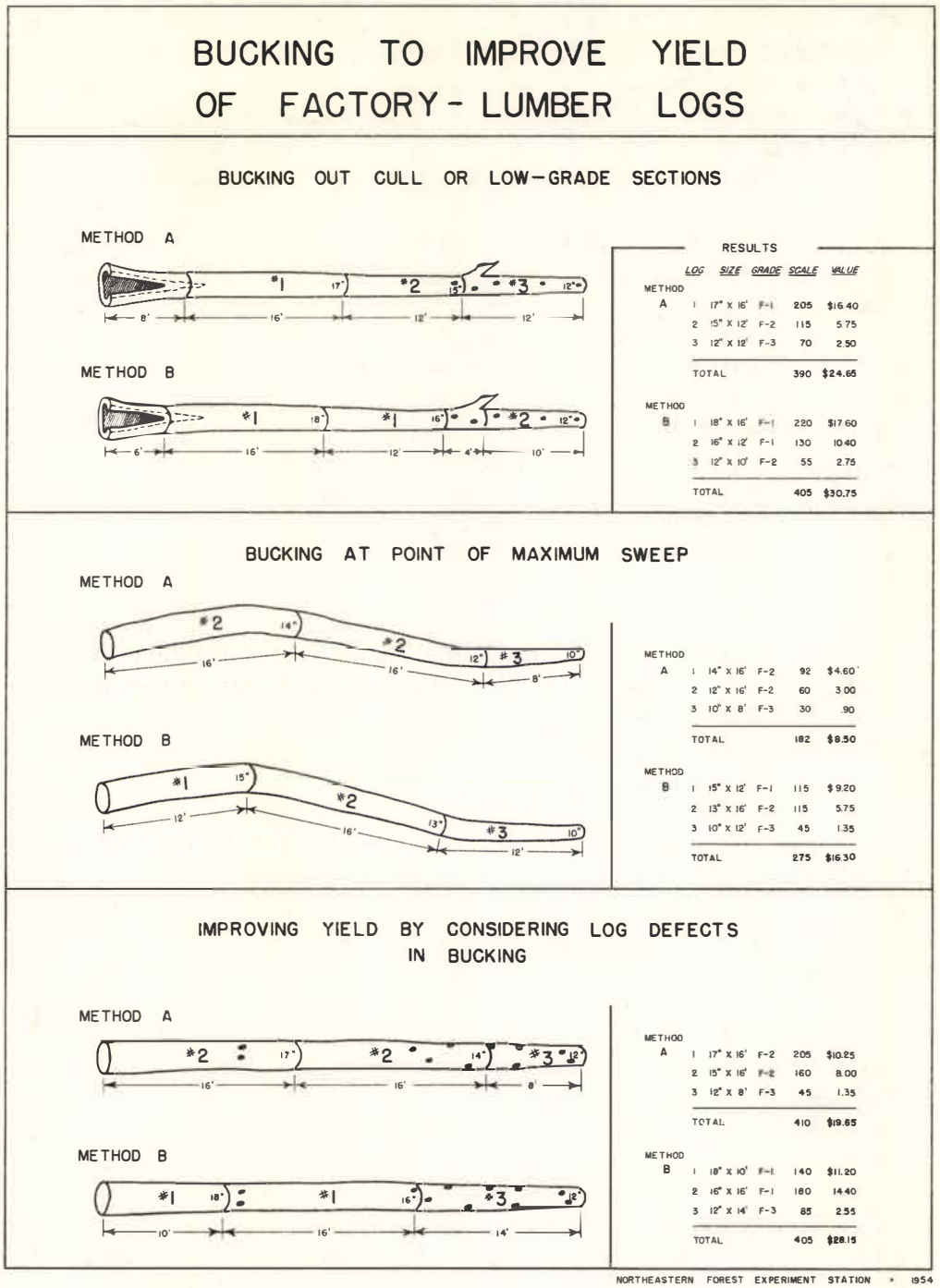

Figure 3.--Methods of bucking full-length beech trees to get the most out of them. Values are based on roadside value per thousand net board feet (International 1/4-inch scale) for different grade logs as follows: F-1, $80; F-2, $50; F-3, $30.

connected to a tree length containing higher value veneer and sawlogs. This is true because the full power of the tractor-arch combination is rarely used in pulling in a load of tree lengths. Thus the charcoal wood or pulpwood can be made available to industries needing them at the landing site for little more than cost of bucking them.

On smaller operations, equipped with horses or lighter tractor equipment, the bigger trees at least will have to be bucked into shorter lengths at the stump, and then the parts can be brought to the roadside. Bucking should be no less carefully done on these smaller jobs. Since these jobs are usually located on farm woodlots or on small accessible timber tracts, with short skidding distances, it is frequently possible to bring out less-valuable products economcially. The farmer can often use beech wood suited for no better use as fuelwood on the home place.

Skidding

Tree-length skidding is particularly worth while in logging beech. Generally more efficient bucking can be done at the landing than in the woods. Entry of stain and decay and checking on the cut ends of logs is delayed, except at the butt and the top.

The medium-size crawler tractor (30 to 50 horsepower), equipped with winch and rubber-tired sulky, is proving to be the most generally useful equipment for bringing beech and other hardwoods to the roadside in the northeastern woodlands. There are few places where such an outfit cannot go. If a rock patch or a soggy place is encountered, the tractor can be taken to the edge of it, and the winch, using the lifting action of the fairlead height, can pull the logs in to the tractor. Then the logs can be dragged, suspended at one end, to the landing. This outfit can--with economy--bunch its own load over a radius of 75 to 100 feet; so fewer skid roads have to be built and a minimum of damage is done to tree reproduction and larger trees left for further growth. Since the logs are dragged on the ground for only a short distance, and that over leaf litter rather than bare soil, they are delivered to the landing reasonably clean and free of dirt and gravel.

Larger tractors (50 horsepower or more) have found little place on northeastern jobs, except for road construction. In a few instances where a truck road would be too expensive to build, logs are sometimes "roaded" behind a

Figure 4.--Tree-length skidding is especially worth while in logging beech; it makes possible more efficient bucking at the landing. The medium-size crawler tractor equipped with winch and sulky is ideal for this kind of skidding job. On small jobs the light crawler tractor and the wheel tractor (above) are often adequate.

large tractor for a mile or more, to where they can be loaded on a motor truck. In such cases the logs should generally be bunched for the large tractor by horses or a smaller tractor. It has been found that the big machines take too long to assemble an economical load for themselves in light and scattered timber stands.

Small crawler and wheeled tractors have a field of usefulness on small jobs, with short skidding distances, or in pole-wood stands (fig. 4). They are especially useful on farm woodlots, where they are dual-purpose machines, used a portion of the year on regular farm jobs. These small machines are tremendously more useful in logging when they are equipped with a rear-mounted winch. Frequently the winch will overcome a deficiency of power in the tractor itself, making it possible to pull out a log from a diffi-

cult place, or through a mudhole. The winch can be depended upon to produce nearly twice the power delivered to the drawbar. Sulkies or booms are also proving their usefulness in hardwood logging with these small tractors, because they make it possible to reach out farther with the cable in bunching, and to skid in larger loads of cleaner logs.

Loading & Hauling

Beech and its associated hardwoods are heavy, and loading and hauling methods and equipment must take this into account. A cord of round green beech wood of good quality can weigh up to 2½ tons, and 1,000 board feet of small beech sawlogs can weigh 5 to 6 tons. A single 4-foot bolt 20 inches in diameter can strain four men to lift it.

The problem of loading such logs in the past has largely been solved by time-consuming rolling on from skidways or brows built and manned by a lavish use of horse- and manpower. The hauling trucks were held up for several hours each day while the loads were being assembled. Bolts and wood were largely loaded piece by piece, by hand, with the bigger sticks split so that men could handle them.

Now, with such amounts of manpower and time no longer available and split sticks no longer acceptable at many northeastern pulp mills, power loading devices are practically a necessity. The small operator or farmer who cannot afford such specialized loading equipment usually should plan to sell his wood at the roadside.

Here too the bigger operators have a choice of equipment. Revolving cranes, mounted either on rubber or on crawler tracks, and costing $8 to $15 thousand, are becoming common for loading logs. They are particularly valuable when tree length-skidding is practiced because they can reach out and assemble the load efficiently from the necessarily large landing. Such cranes are also used in handling bundles of pulpwood. But the favorite tool for loading 4-foot wood is undoubtedly the powered conveyor, often mounted on a wheel tractor or an old truck chassis.

Power equipment is becoming available for the medium-sized logging operator too. Frequently this takes the form of a self-loading device for the log truck itself, powered by a take-off on the truck transmission. At least three types of such loaders are commercially available, and many

adaptations have been built by northeastern loggers themselves. Light and inexpensive conveyor loaders are also available for the small operator. Two types of such loaders, manufactured in New Hampshire and Maine, weigh only about 300 pounds, complete with 3-horsepower air-cooled gasoline motor. They are designed to be propped against the side racks of a truck, to carry the bolts up from the ground to the top of the rack.

Loading of trucks used for hardwoods must be closely watched to guard against overloading and consequent breakdowns. Heavier and heavier trucks are being used by commercial operators. Trucks licensed for 30 to 40 thousand pounds gross vehicle weight are becoming common. Trucks of 14 to 16 thousand pounds gross vehicle weight, commonly used by smaller operators, are often specially reinforced in frame and springs, with tandem axles and lower gear ratios installed to enable them to carry heavier loads. Almost any good garage can do this job. Without it such light trucks should be limited to loads of 1,000 board feet log scale or less of beech and associated hardwood logs. Reinforced trucks can often carry 1,500 feet of hardwood logs.

Debarking

For many uses, notably high-grade pulpwood and wood to be treated with preservatives, the bolts or poles must be free of bark. This means that the bark must be removed. Beech is one of the more difficult species to debark by traditional methods. In common with most other hardwoods it has a short "sap-peeling" season during which the bark separates from the wood easily. Beech bark splits both crossways and lengthwise easily so it comes off only in small pieces. The time when hardwood can be sap-peeled will vary in different localities with the latitude, the altitude, and even the direction of the slope. Usually it will only last 6 to 8 weeks, falling in April, May, or June over most of the Northeast.

During the sap-peeling season bark can be removed rather easily by hand methods. Many pulp mills are now paying $4 to $5 more a cord for peeled wood than for wood with the bark on. But this is not all clear gain. Even a species as thin-barked as beech will be reduced about 10 percent in stacked volume when the bark is taken off. This means that if peeled wood is worth $20 a cord and rough wood $15, a cord of rough wood when peeled will stack up to

only 9/10 cord, worth $18. That gives the logger $3 a cord for his peeling work. Generally he cannot do a peeling job for that.

It is usually more profitable to sell the wood with the bark on, if this can be done. Some very efficient debarking machines have been developed for large-scale installations, but some pulp mills do not have these machines, and refuse to buy rough wood.

The tool commonly used for sap-peeling in the Northeast is the spud. There are many variations of this tool, but essentially it is a slightly curved strip of tempered steel, about 1½ inches wide, rounded and sharpened at one end and with a wooden handle on the other. Peeling is generally done on freshly felled tree lengths before they are moved. First the bark on the top side of the tree length is split lengthwise with a series of ax cuts; then the spud is inserted in this slit between the bark and the wood, and the bark is pried off, first on one side and then on the other. Sap-peeling of beech is slower and more difficult than is peeling of many of its associated hardwoods.

Hand peeling can also be done at other times of the year with knives of different types. Most useful is the timber shave, which is a large heavy version of the familiar carpenter's drawshave, usually with a slightly curved blade to enable it to contact more of the surface of the round stick. Axes and wide-bladed spuds are also employed to shave the bark off.

A new method of getting the bark off in the woods, called chemical girdling, offers promise to make the peeling of beech much cheaper and easier (fig. 5). This involves making a 3- to 6-inch wide girdle through the bark around the butt of the standing tree, during sap-peeling season, and painting on a chemical solution.

A 30-percent solution of sodium arsenite has proved to be the most useful chemical to date. This kills the tree in a few days. After the standing dead tree has been left for a curing period (generally about 90 days for beech), the bark becomes very loose above the girdle, and remains that way except when the moisture in the wood and bark freezes during the coldest days of the winter.

Beech bark becomes so loose after the curing period that much of it falls off the tree of its own weight, and

NEW YORK STATE CONSERVATION DEPARTMENT PHOTO

Figure 5.--The new chemical girdling method makes beech easy to debark. After girdling and a treatment with sodium arsenite, the bark becomes so loose that much of it falls off of its own weight and most of the rest falls off during felling, skidding, and loading.

the majority of the remainder falls off during felling, skidding, and loading so that practically no further work needs to be done to obtain wood acceptable as "peeled" at most pulp mills. This chemical girdling has proved useful with all northeastern hardwoods but it has worked better with beech than any of its associates. Bark of maple, birch, oak and other hardwoods is permanently loosened too, but the chemical is not always so thoroughly distributed in some of these species, so that streaks of tight bark are sometimes encountered. Also, since the barks of these species are stronger than that of beech, either transversely (birch) or longitudinally (maple), some cutting is usually necessary to make it come off the sticks. U. S. patent rights on this process are owned by the Armstrong Forest Company of Johnsonburg, Pa., but they have been made generally avialable to public use.

Experiments are continuing in an attempt to find a chemical that will do this job as well as sodium arsenite but that will be less poisonous to men and animals. Improved methods of application are also being looked for. Meanwhile, however, the chemicals and methods developed to date are being widely promoted and used on commercial pulpwood logging jobs throughout the Northeast. Between 50 and 60 thousand cords of standing trees were treated this way in the 12 Northeastern States in the spring of 1952.

Several girdling tools have been developed to prepare the place for application of the poison, and three are available commercially through northeastern suppliers of woods equipment. All of these tools, however, work only on smooth round trees; so an ax is still necessary to complete the girdle in flutes and hollows in the stem. Consequently the majority of the girdling work done in advance of application of the chemical is being done with the ax. For applying the chemical, a back-pack tank is often used with a hose connected at a lower corner and leading through a hole in the handle into the bristles of a paint brush at the lower end. This helps prevent spillage of the chemical and makes its application easier.

Costs of the complete chemical-girdling treatment, including the girdling, the chemical, and application will vary in different types of stands, but they rarely average more than 50 cents a cord.

Another good method for removing beech bark in the woods, where the using company will accept the result, is

"bug peeling." This involves leaving the cut pulpwood in the woods for a year or more and depending on the processes of aging, the weather, and insects to loosen the bark. This also works especially well with beech, but there is, of course, considerable deterioration of the wood, including the introduction of stains and decay. Before trying this method the logger should check whether local pulp mills will accept wood treated this way.

Attempts are being made to develop an inexpensive, light, and effective mechanical debarker that can be used on woods jobs. To date no such debarkers are available that can be recommended for use on beech and other hardwoods. Those that work best depend on knives to remove the bark, and it is practically impossible to set such knives so that they will remove all or nearly all of the bark and none of the wood. None of the portable debarkers depending on friction, pressure, or abrasion has as yet proved successful for hardwoods outside the sap-peeling season. Developmental work is being pressed forward, however, by a number of different agencies, and possibly a satisfactory mechanical debarker will become available in the future.

PREVENTION OF DETERIORATION

Beech logs and bolts are especially subject to deterioration if they are left exposed to the weather for any length of time. The ends of cut sticks crack and check; and stains, insects, and decay attack the sapwood especially. This is true of other hardwood species too, but unlike them beech bark ruptures so easily that these destructive agencies attack the wood much sooner through the sides of the cut sections. Consequently end-coatings, which are valuable for use on other hardwoods that are delayed enroute from the woods to the mill, cannot be depended upon to protect beech except for a short time.

The best method of insuring that beech logs and bolts get to the mill in the best possible shape is to plan on a "hot" logging job. That is, to keep the wood moving along steadily, with no appreciable delays in the woods, at the landing, or elsewhere enroute.

If beech logs and bolts have to be delayed, the next best method of reducing deterioration during delays is to

store them in water.[3] Because beech is heavy some of the logs will sink, at least partially. Consequently a boom in a running stream or large lake cannot be depended upon to contain them. Water storage must be in a pond, or each individual log must be held by a chain or cable.

Keeping the logs in tree lengths as long as possible, or using end-coating within 24 hours after cutting are of value in reducing deterioration of beech only as a last resort when "hot" logging or water storage is impracticable and delays cannot be avoided.

SPECIFICATIONS FOR PRODUCTS

Many northeastern wood-using industries buy their raw material "woods run" or have some very loosely drawn specifications for the material they will accept. Some of these specifications are too restrictive, because of unfortunate experiences with a species in the past; and some of them are not restrictive enough, resulting in the acceptance of material that cannot be converted profitably, and depressing the price of all the material that is accepted.

Beech has suffered more than most of its associated species from this type of specification (fig. 6). Because much of the beech available is of low quality, it is sometimes impossible to get a reasonable price for good-quality beech. Many wood-using industries refuse to accept beech at all, even though there is beech available that will satisfy their needs better than much of the material of other species that they are accepting.

The U. S. Forest Service, through its Forest Products Laboratory at Madison, Wis., and its regional forest experiment stations, is attempting to develop a soundly based and workable system of product specifications for native hardwoods. This is a long-time job, and it is only partially completed. The first portion to be completed was a set of specifications for hardwood logs suitable for conversion into factory lumber. These are described in a mimeographed

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[3] SCHEFFER, THEODORE C., AND ZABEL, ROBERT A. STORAGE OF BEECH LOGS AND BOLTS IN THE NORTHEAST. NORTHEAST. FOREST EXPT. STA., BEECH UTIL. SER. 2. 13 PP., ILLUS. 1951.

Figure 6.--Because much beech is poor, there are some prejudices against all beech; and high-quality beech often does not bring the price it deserves. To improve such marketing conditions, the U. S. Forest Service is developing a method of grading hardwood logs according to quality.

report published by the Forest Products Laboratory in 1949 and available from that institution.[4]

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[4]UNITED STATES FOREST PRODUCTS LABORATORY. HARDWOOD LOG GRADES FOR STANDARD LUMBER. PROPOSALS AND RESULTS. U.S. FOREST PROD. LAB. RPT. D1737. 15 PP. ILLUS. MADISON, WIS. 1949.

Specifications for hardwood logs and bolts for other products are still in the formative stage, and no publications have been issued covering them. However, these unpublished studies, as well as specifications currently used by representative northeastern wood-using industries, have been drawn upon in compiling the following suggested minimum specifications for beech products. The logger is advised to check the specifications used by the industry to which he intends to deliver his product before he cuts it.

Where the receiving plant has no specifications, or the specifications in use are ambiguous, it might be a good idea for the logger to follow those that are given here in segregating his product. After a consignment or two he might find it possible to ask for a better price than his competitors receive for delivering "woods run" material.

Sawlogs

There are three major types of long-log hardwood sawmills in the Northeast (classified on the basis of the type of product). They are:

1. Mills primarily producing factory-grade lumber. This type of mill finds its major market at furniture factories, flooring plants, and other outlets requiring graded lumber. It is the most common type of mill.

2. Mills producing hardwood structural material, including ties and timbers for the railroads, for barn frames, and the like, as a primary product.

3. Mills producing low-grade or ungraded material for local use. Most such mills are small and their product is sold largely in their immediate localities for rough construction, grain-car doors, agricultural field crates, industrial blocking, and similar products.

These three types of mills have need for beech logs of different minimum standards, as follows:

Type 1 (factory logs).--Type 1 mills depend for the most part on markets for No. 1 Common and better lumber as defined by the National Hardwood Lumber Association. They will, of necessity, have to produce some lower grade factory lumber, and probably some structural and local-use material, because all hardwood logs produce some material of this

sort; but such material may actually be unprofitable for them to handle. A good guide for such mills is found in the specifications of the U. S. Forest Service for factory-log grade No. 2, which are shown below:

Specifications For Factory Logs*

No. 2

Scaling diameter, in inches		11+	12+		
Length without trim, in feet		10+	8-9	10-11	12+
Clear cuttings on one of best three faces	Min. length, feet	3	3	3	3
	Maximum number	2	2	2	3
	Yield in % of length	2/3	3/4	2/3	2/3
Sweep allowance, in percent of gross scale :		30			
Combined sweep and cull allowance, in percent :		50			
Maximum diameter of sound end defects	Logs under 16 inches :	1/2 log diameter			
	Logs over 16 inches :	3/5 log diameter			

*Full details of a system developed for grading all species and grades of factory-class logs will be found in U. S. Forest Prod. Lab. Rpt. D1737, 1949 (see footnote 4).

A "face" as used in these specifications is one quarter of the circumference of the log. A "clear cutting" is a length of the selected face that is completely free, all the way across, of any defect that will prevent obtaining clear lumber underneath that section of the face inside the slab and outside the heart center. Such defects include sound and rotten knots, bird pecks, insect holes, and interior rots that extend outside the heart center. Some typical blemishes on beech bark that indicate the limits of clear cuttings, and some others that do not, are shown in figures 7 to 9.

In classing and grading logs, it is important to understand the significance of log defects. Much information on this subject is contained in U. S. Department of Agricul-

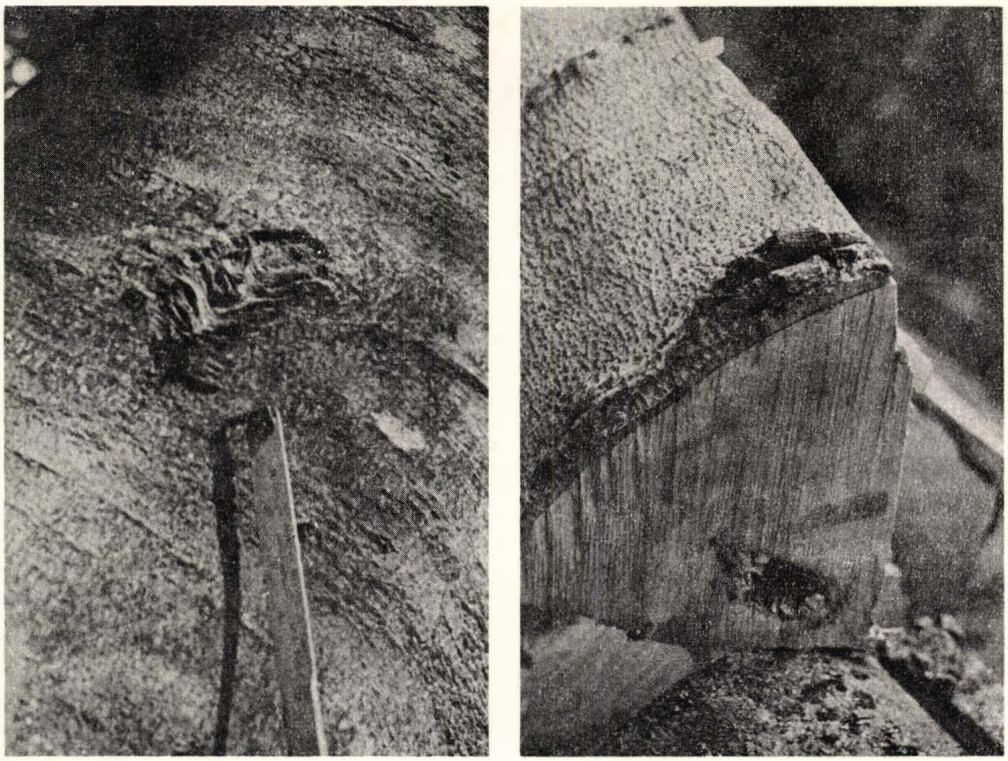

Figure 7.--The log defect seen on the log at the left is an overgrowth indicating a knot that will show up shortly after the slab is taken off. But the bark distortion on the right indicates a knot that is buried so deeply that on logs more than 15 inches in diameter it can be disregarded. Such bark scars make a log look worse than it really is.

ture Handbook No. 4 ("Log defects in southern hardwoods," by Lockard, Putnam, and Carpenter), which can be obtained from the Superintendent of Documents, Washington, D. C.

Type 2 (construction and tie logs).--Mills cutting beech logs into ties and construction material will find the following specifications, as defined in the Forest Service standards, to be suitable for the minimum-quality log:

Minimum diameter, small end--8 inches.

Minimum length, without trim--8 feet.

Clear cuttings--No requirements.

Sound knots--Any number if the diameter of the collar of

no one knot or the sum of the diameters of the collars of any whorl of knots does not exceed one-third the diameter of the log at point of occurrence.[5]

Rotten knots or other unsound surface defects--None that will be found in an included square timber.

Holes--Any number if none has a diameter more than one-third the diameter of the log at point of occurrence and does not extend more than 3 inches into included timber.

Allowable sweep--One-quarter of the small diameter for each 8 feet of length.

Unsound end defects--None permitted.

Sound end defects--No requirements.

Type 3 (local-use logs).--To be suitable for conversion into products for local use, beech logs might have the following minimum specifications:

Minimum diameter--8 inches.

Minimum length--8 feet.

Clear cuttings--No requirements.

Sound or rotten knots--Any number if no one knot or the sum of the diameters of any whorl of knots does not exceed one-half the log diameter.

Allowable sweep--One-half diameter of small end.

Total allowance for cull and sweep--50 percent.

End defects--No requirements

These local-use specifications are only tentative, and are meant to provide a practical minimum limit for the poorest hardwood log that might be brought to a sawmill. In many areas, logs excluded from the factory-lumber and structural classes, but which meet the local-use specifications, will not repay the cost of cutting or hauling unless they come from the immediate vicinity.

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[5] LARGER KNOTS ARE PERMITTED IN LOGS SPECIFICALLY CUT FOR TIES. IF KNOTS ARE OUTSIDE THE BEARING AREA. THIS IS THE SECTION ON EACH END BETWEEN 20 INCHES AND 40 INCHES FROM THE MIDDLE. FOR STANDARD NO. 5 TIES, THE LOGS SHOULD BE AT LEAST 11 INCHES IN DIAMETER AND 8½ FEET LONG. SOME MILLS WITH SPECIAL MARKETS WILL NO DOUBT HAVE HIGHER SPECIFICATIONS THAN THE MINIMUM.

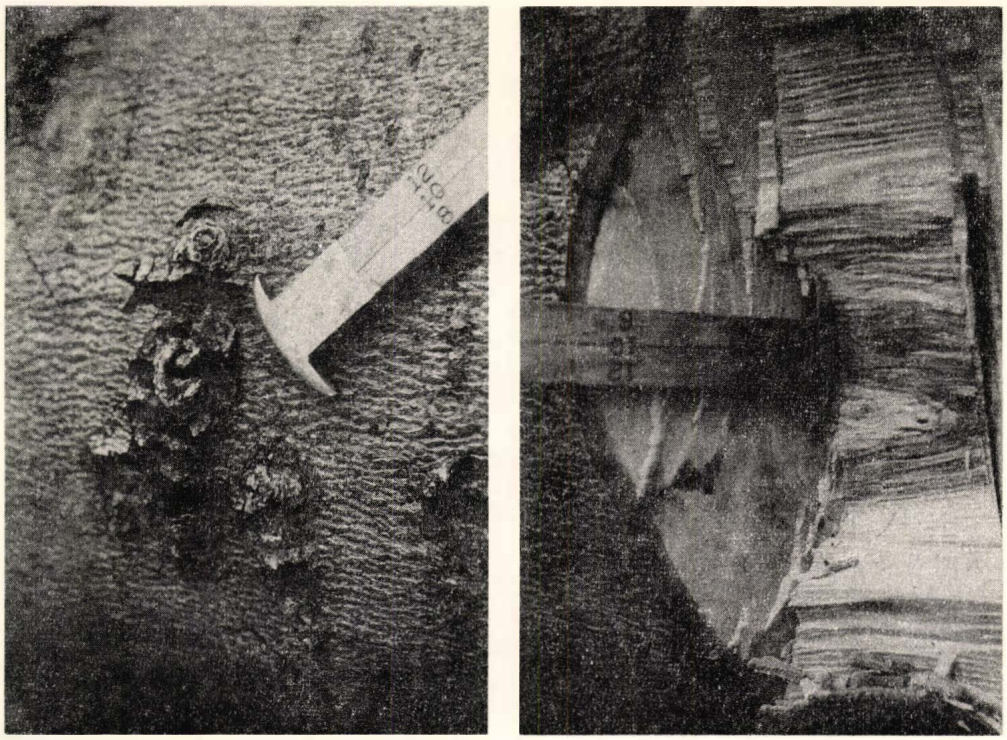

Figure 8.--The overgrowths on this beech log (left) indicate the presence of adventitious buds or pin knots in the underlying wood. These overgrowths are an important kind of log defect, because the knotlets underneath go from the surface all the way to the heart of the log (right).

Veneer Logs

Commercial veneer plants that cut beech will necessarily have different specifications according to the product they are cutting and the kind of equipment they use. Some that cut veneer for small products such as school seats and have lathes adapted to such material will be able to use high-quality beech bolts as short as 6 feet. Timber operators who want to produce commercial veneer logs but do not have detailed veneer-plant specifications can use the following as a guide in making and marketing veneer logs. These specifications are based on those for No. 1 or veneer logs, as published in the official Log Grading Rules of the Northern Hemlock and Hardwood Association (1947 edition):

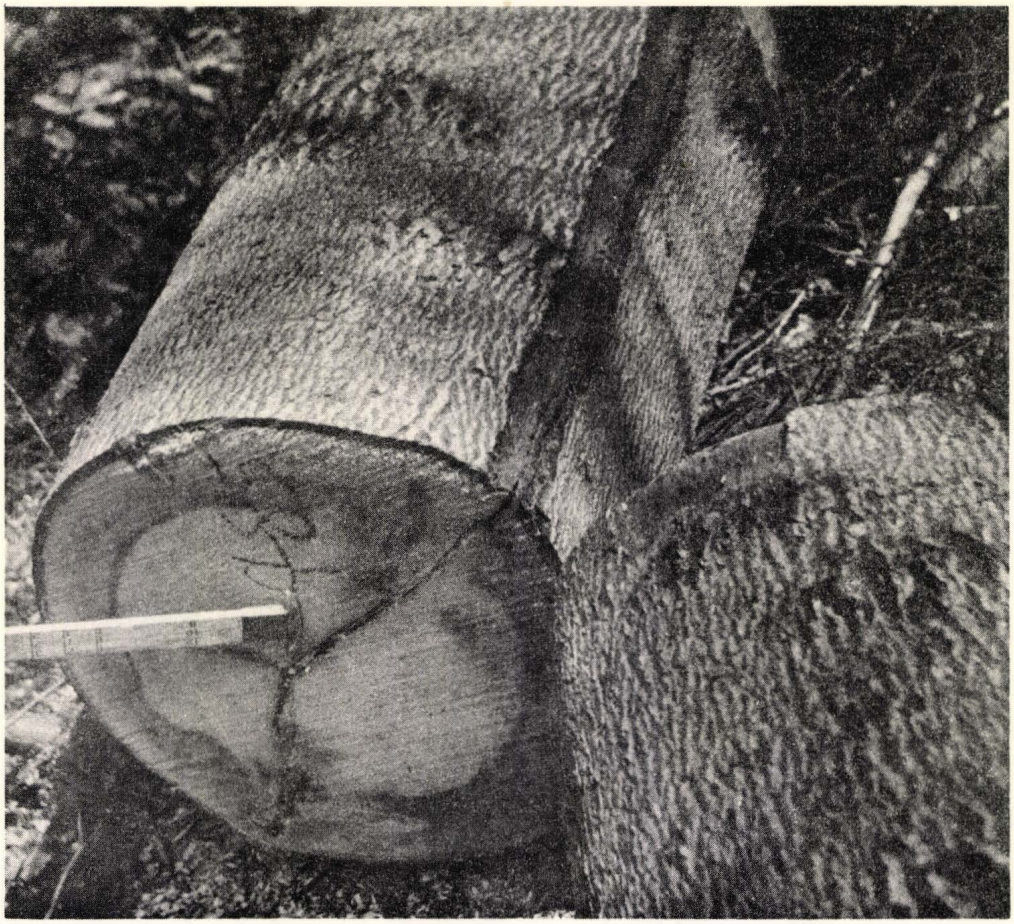

Figure 9.--This frost crack is not a serious defect because it is straight and decay has not entered. It will cause little loss of lumber yield. Trees with spiral cracks must be cut into short lumber to avoid loss.

Northern Hardwood Commercial Veneer Log Grading Rules

Length--6 feet up, plus trim of 4 inches.

Diameter, minimum--12 inches (except all-clear logs can be 11 inches).

Grain--No spiral grain permitted (deviation of more than 1 inch in 10 inches is considered as "spiral").

Seams--(a) No spiral seams permitted (deviation 4 inches in length of log).

(b) One straight seam permitted in logs 15 inches and over; none in smaller logs.

Sweep--(a) 6- to 9-foot logs:
12 to 14 inches diameter: no sweep allowed.
15+ inches diameter: 15% absolute sweep permitted.
(b) 10- to 16-foot logs: no sweep requirement in logs of any diameter. (Crooks and kinks are defects: see below.)

Unsound end defect--All sizes: no cull limitation except all must be confined to a central core, the largest diameter of which is not more than one-third that of scaling diameter.

Standard defects--All diameters:
(a) 6- to 7-foot logs: none (must be clear).
(b) 8- to 9-foot logs: one, if not more than 10 inches from an end.
(c) 10-foot logs: one.
(d) 12-foot logs: two.
(e) 14- to 16-foot logs: three.
(A standard defect is one log defect or group of defects confined to a 1-foot band around the log.)

Bolt Wood

For sawed products.--Specifications of bolt wood for sawing vary considerably with the equipment to be used and the product being made. As stated previously, the most common length purchased in the Northeast is 4 feet, but some mills demand bolts 5 or 6 feet long, or even longer. The logging operator is advised to obtain detailed specifications from his local outlets before he attempts to make beech bolt wood. Here, however, are some general specifications that may be useful as a guide:

Minimum top diameter--8 inches.

Minimum length--4 feet.

Maximum sweep and crook deduction--15 percent.

Clear cutting (best 3 faces)--Minimum length, 2 feet; Maximum number on face, 2; minimum yield in face length, 2/3.

Total cull allowed (including sweep)--25 percent.

Sound end defects--1/4 area outside heart core.

Figure 10.--Beech at its best. This log is suitable for use as veneer.

Pulpwood.--The size and class of pulpwood purchased also varies with the individual mill. Generally no wood smaller than 3 inches in diameter inside bark is bought, but some mills have minimums as high as 5 inches. The standard length in New England and northern New York State is 4 feet, in northwestern Pennsylvania it is 52 inches, and further south it is generally 5 feet. Some general specifications follow:

Crook and sweep--Not greater than diameter of stick.

Allowable defect--Up to 33 percent rot, to be deducted for in scale. No char allowable.

Knots--To be trimmed flush with surface. Some mills limit knottiness.

Peeled wood--To be free from all inner bark.

Charcoal and distillation wood.--May be accepted in blocks (12 to 15 inches long) or bolts 4 feet or 52 inches long. Blocks bigger than 15 inches in diameter generally have to be split, all bolts to be split so that they will pass through a 10-inch ring. Rotten wood and wood with crook greater than $1\frac{1}{2}$ times the diameter to be subject to deductions from scale.

Round mine timbers.--Purchased in varying lengths and diameters at different mines. In general they should be absolutely sound and free from knots or whorls of knots in excess of 1/4 diameter of stick at point of occurrence. Abrupt crook is not acceptable and sweep should not exceed diameter of stick in 10 feet of length.

AGRICULTURE-FOREST SERVICE-UPPER DARBY

(CONTINUED FROM INSIDE OF FRONT COVER)

* Chemistry and chemical utilization of beech.
  Management of beech.
  Beech availability and supply.
  Present markets and uses for beech.
* Methods of logging beech.
  Seasoning of beech.
* Storage of beech logs and bolts.
* Machining of beech.
  Milling of beech.
* Gluing techniques for beech.
* Steam-bending of beech.
  Preservative treatment of beech.
* Beech for flooring.
  Beech for furniture.
  Beech for turned products and novelties.
* Beech for veneer and plywood.
  Beech for fuel and charcoal.
  Beech for cross ties.
* Beech for containers.
  Pulping and defiberization of beech.
  Rough construction on the farm with beech.

The Northeastern Station acknowledges gratefully the effort being devoted to these problems by the many agencies and individuals who are cooperating in this project. Among the leaders in it are David B. Cook, New York State Conservation Department; Claude Bell, U.S. Forest Products Laboratory; A. H. Bishop, State University of New York, College of Forestry; and Fred Wangaard, Yale University School of Forestry. These men, along with Fred C. Simmons and C. R. Lockard of the Northeastern Station, comprise the "working committee" that is directing and coordinating the project.

The information gathered in this widespread cooperative project should be of great use to the wood-using industries of the regions where the wood of American beech is available.

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*Reports published.